



Cultivating epistemic empathy in preservice teacher education

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HIGHLIGHTS

- We explore the cultivation of epistemic empathy in a preservice teacher program.
- We examine teachers' expressions of epistemic empathy in response to videos of student inquiry.
- All teachers expressed more epistemic empathy at the end of the course.
- Various tensions emerged as teachers learned to empathize with learners' inquiry.

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ABSTRACT

This study investigates the emergence and cultivation of teachers' "epistemic empathy" in response to analyzing videos of student inquiry. We define epistemic empathy as the act of understanding and appreciating someone's cognitive and emotional experience within an epistemic activity—i.e., activity aimed at the construction, communication, and critique of knowledge. Our goals are (1) to conceptually develop the construct and contrast it to more general notions of caring and (2) to empirically examine epistemic empathy in the context of preservice teacher education. We discuss tensions in teachers' expressions of epistemic empathy, and we end with implications for research and practice.

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1. Introduction

In response to a video in which a group of elementary students struggle to make sense of a melting ice cube and of cloud formation, Helen¹ and Laura, two preservice teachers, note:

[Jack] brings up the idea that "A pool of water is expanded more than an ice cube" (1:25). Although this idea has some flaws, you can see he is trying to make a connection of water in various states to real life examples. [...] Initially watching the video, when Jack compares a pool to an ice cube, (1:25) I immediately wanted to jump in and question the validity of his argument. However, after this course, I am glad the teacher did not because it gave other students an opportunity to form questions about

his argument. Often teachers want to immediately jump in to correct an invalid idea [...] But I think it serves purpose to let the students investigate on their own because it helps them feel they are playing a key role in the development of the ideas. (Helen, post video-analysis)

The one thing that excites me the most is all the different ideas/ observations the students have made about such an everyday phenomenon. Just to see how different every student thinks about the processes of cloud formation and precipitation is mind blowing! All the students have some sort of productive beginning in their thinking about these processes that could really be something to look at and consider seriously. (Laura, post video-analysis)

The excerpts above are from written reflections on classroom videos that Helen and Laura submitted at the end of a course early on in their teacher preparation program. These quotes showcase something that we noticed as instructors of the course in our

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¹ All preservice teachers' names are pseudonyms.

science and mathematics preservice teachers (PTs)' efforts, something that we came to refer to as PTs' *epistemic empathy*.

In the above quotes, for example, Helen's reflection shows evidence of her becoming more attuned to students' sense-making and efforts to seek coherence (e.g., "you can see he is trying to make a connection"). It also illustrates the value that Helen places on the uptake of students' ideas regardless of their correctness (e.g., "although this idea has some flaws" ... "I am glad the teacher did not [jump in and question the validity of his argument]"). This quote also demonstrates Helen's recognition of the importance of students' intellectual agency in their learning (e.g., "[the opportunity] helps them feel they are playing a key role in the development of the ideas"). Her attention to learners was paired with a consideration of the teacher's experience, as Helen makes sense of the motivation behind the teacher's actions. Laura's reflection shows her evident enthusiasm and excitement for students' ideas and her appreciating the productive seeds in their thinking.

These quotes exemplify how PTs came to tune in and take seriously the perspectives of students and teachers in the classroom videos they watched. The PTs' comments reflect a shift in their awareness that learners have something valuable to offer even when their ideas are in tension with the canon, an awareness that is deeply humanizing. It is this ability to step into someone else's sense-making experience and see the merits in their reasoning and emotions – what we term as epistemic empathy – that drives our research inquiry. We begin by examining why epistemic empathy matters in light of current reform efforts in science and mathematics education.

2. Motivation for the study

Recent research and policy documents across the world emphasize the need to engage students in scientific and mathematical sense-making (e.g., Council of Chief State School Officers, 2010; National Research Council, 2012; OECD, 2016; Office of the Chief Scientist, 2014) by drawing from and building on the resources, questions, and interests that students bring to the classroom (Engle & Conant, 2002; Nasir & Hand, 2008; Rosebery, Warren, & Tucker-Raymond, 2016). Sense-making entails using various sources of knowledge and experiences to generate questions, make connections, formulate causal accounts, notice inconsistencies and work to reconcile them, all in pursuit of clear, coherent understandings of phenomena (Hammer, Russ, Mikeska, & Scherr, 2008). Positioning students as sense-makers in science and mathematics classrooms is critical, especially for students from traditionally underrepresented populations, so that they see themselves not as recipients but as active participants in developing ideas and knowledge.

Responsive Teaching, which centers on attending to, eliciting, and responding to student thinking, holds great promise for realizing this goal (Robertson, Scherr, & Hammer, 2015). In this instructional model, teachers place students at the center of instruction where they take active roles in developing questions, constructing ideas, and pursuing explanatory accounts of phenomena (Hammer, Goldberg, & Fargason, 2012). Responsive teachers identify and discover instructional objectives from students' inquiry and adjust their instruction accordingly (e.g., Ball, 1993; Hammer, 1997; Levin, Hammer, & Coffey, 2009; Lineback, 2015).

This approach, Richards and Robertson (2015) explain, is not new; it has its roots in constructivist approaches to learning and instruction, including in Dewey's (1997) vision to put the learner at the heart of the educative process where "educators scout ahead 'to see in what direction an experience is heading' (p. 38) and assess its potential for growth toward particular ends" (p. 36). Robertson et al. (2015) add that, with its focus on building from the

disciplinary ideas and connections in student thinking, responsive teaching is at once responsive to students' needs, interests, and ways of knowing, while also being accountable to the discipline.

Published case studies of responsive classrooms present compelling evidence that this instructional approach can indeed foster learners' disciplinary engagement around rich conceptual content (e.g., Atkins & Frank, 2015; Hammer et al., 2012; Maskiewicz & Winters, 2012). Research also shows that responsive teaching promotes equitable participation from culturally, linguistically, and socioeconomically diverse students (e.g., Michaels, 2005; Rosebery et al., 2016).

However, despite the growing attention to responsive teaching in science and mathematics, there is yet much to be learned about the underlying dynamics behind responsiveness and how best to prepare preservice and early career teachers to become responsive (Kang & Anderson, 2015; Rosebery et al., 2016). We argue that "epistemic empathy" is key to responsive teaching. We define epistemic empathy as the act of understanding and appreciating someone's *cognitive* and *emotional* experience within an epistemic activity, meaning an activity aimed at the construction, communication, and critique of knowledge. Epistemic empathy entails an ability to take learners' perspectives and identify with their sense-making experiences, in service of fostering their inquiry. While research on responsive teaching often hints at the importance of teachers' epistemic empathy, little has been done to examine this construct, and how it might relate to and possibly serve as a mechanism for responsiveness.

We arrived at the notion of epistemic empathy rather opportunistically: we initially set out to explore how preservice teachers (PTs) develop facility with attending and responding to student thinking. However, as we examined how PTs began to make sense of videos of student inquiry, we became intrigued by their increasing tendency to take on the learners' perspectives, as illustrated in the introductory vignettes.

We saw PTs tuning in to the learners' experiences to identify merits in their reasoning from the learners' standpoint (e.g., "All the students have some sort of productive beginning in their thinking ... that could really be something to look at and consider seriously."). We noticed PTs explore possible reasons behind students' thinking (e.g., "Sandra introduces the notion of clouds joining together [...] I can see that Sandra is probably drawing from her experience watching clouds shift before, during, and after it rains"). Too, they attempted to identify why certain ideas might be challenging (e.g., "I think students had trouble visualizing how a rubber band, which essentially is 2D, could relate to a cloud"). They also expressed curiosity about and enthusiasm for students' ideas (e.g., "I wish I could have watched more to see how they would explain the raindrops"; and "It just made me really excited to see the refinement of ideas from student to student").

We came to refer to this orientation as PTs' developing "epistemic empathy." As such, we arrived at the notion in ways that mirror what diSessa and Cobb (2004) describe as unforeseen theoretical interests or "ontological innovation." Accordingly, our goal in this paper is to explore this innovation in order to (1) develop the construct of epistemic empathy and (2) empirically examine the nature of and shift in PTs' epistemic empathy in a course designed to promote attention and responsiveness to student thinking.

The paper is in three parts: First, we discuss how empathy has been conceptualized in various fields to motivate the importance of considering its epistemic role in the context of teaching. Second, we explain our methods for data collection and analysis. Third, we discuss our findings to characterize PTs' epistemic empathy and to examine shifts and tensions they experienced along the way. We end with implications for research and practice, specifically with

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